

Claims

1. A surgical instrument, comprising:
 - an end effector responsive to a longitudinal firing motion to perform a surgical operation;
 - a shaft distally connected to the end effector;
 - 5 a firing member slidably receiving by the shaft to transfer the firing motion to the end effector; and
 - a handle proximally connected to the shaft and firing member, comprising:
 - a barrel portion longitudinally aligned with the shaft,
 - a grip portion projecting from the barrel portion,
 - 10 a linked rack formed from a plurality of links positioned in the barrel portion and distally coupled to the firing member, and
 - a firing mechanism coupled to the linked rack to impart the firing motion.
2. The surgical instrument of claim 1, wherein said linked rack formed from a plurality of links is positioned in said barrel portion and in the grip portion of said handle.
3. The surgical instrument of claim 1, wherein each of the plurality of links are pivotally connected.
4. The surgical instrument of claim 3, wherein each of the plurality of links are pivotally connected to an adjacent link by a connection offset from a longitudinal axis of the linked rack.
5. The surgical instrument of claim 2, wherein each of the plurality of links are pivotally connected to an adjacent link by a pin member.
6. The surgical instrument of claim 1, wherein each of the plurality of links contacts an adjacent link to form a flexible connection.

7 The surgical instrument of claim 1, wherein each of the plurality of links contacts an adjacent link to form a pivotable connection that is operably configured to pivot between a straight configuration defined by the barrel portion and a bent configuration defined by the grip portion.

9. The surgical instrument of claim 1, wherein at least one link member includes a pusher surface operably engageable with said firing mechanism for imparting firing motion to said firing member.

10. The surgical instrument of claim 10, wherein said linked rack formed from a plurality of links is operably coupled to a retraction member to move said firing member proximally in said barrel portion.

11. The surgical instrument of claim 10, wherein said linked rack formed from a plurality of links is operably coupled to a retraction member that is bendable.

12. The surgical instrument of claim 11, wherein said retraction member comprises a spring.

13. The surgical instrument of claim 10, wherein a distal end of said linked rack formed from a plurality of links is operably coupled to said retraction member.

14. The surgical instrument of claim 1, wherein at least a portion of said linked rack is moveable within said shaft.

15. The surgical instrument of claim 1, wherein said end effector comprises a stapling device responsive to the longitudinal firing motion to perform the surgical operation of stapling.

16. The surgical instrument of claim 15, wherein said end effector comprises:
an elongate channel connected to said shaft;
an anvil pivotally coupled to said elongate channel for clamping tissue; and
a staple cartridge received in said elongate channel;
- 5 wherein said firing member distally terminates in a firing bar operably configured to
actuate said staple cartridge to form staples in the clamped tissue.
17. The surgical instrument of claim 15, further comprising a closure means of said
stapling device.
18. The surgical instrument of claim 1, further comprising a nested
tension/compression spring coupled between the firing member and the grip portion.
19. The surgical instrument of claim 18, further comprising a curved band connected
at one end proximally to a distal link of the plurality of links and connected at the other
end to a free end of the nested tension/compression spring.

20. A surgical instrument, comprising:
an end effector responsive to a longitudinal firing motion to perform a surgical operation;
a firing actuator responsive to a user to operably configured to produce the firing
5 motion;
a plurality of linked members coupled to the end effector to transfer the longitudinal firing motion; and
a firing mechanism coupled to the firing trigger and selectively engageable to the
linked members to transfer the firing motion from the firing trigger through the
10 plurality of linked members as a distally moving longitudinal motion.
21. The surgical instrument of claim 20, wherein the each of the plurality of linked members includes a pivotal connection between adjacent linked members operably configured to allow a bending between adjacent links in an arc.
22. The surgical instrument of claim 21, wherein the pivotal connection comprises a clevis.
23. The surgical instrument of claim 21, wherein the pivotal connection is positioned offset from a longitudinal axis of the plurality of linked members when straight, adjacent linked members including abutting surfaces registered to arrest movement tending to bend adjacent links in an arc opposite to the offset of the pivotal connection.

24. A surgical instrument, comprising:
- an implement portion responsive to a firing motion and diametrically dimensioned for endo-surgical use, the implement portion comprising:
- a shaft;
- 5 an elongate channel coupled to the shaft,
- an anvil pivotally coupled to the elongate channel, responsive to the closing motion from the shaft, and including an anvil channel,
- a firing bar including a distally presented cutting edge longitudinally received between the elongate channel and the anvil, and
- 10 a staple device received in the elongate channel and responsively coupled to the firing bar to form staples against the anvil; and
- a handle, comprising:
- a firing mechanism responsive to a user actuation to produce a firing motion, and
- a rack means responsive to the firing mechanism to rigidly drive the firing bar and
- 15 to subsequently bendably retract.